

Oregon Department of Agriculture
Plant Pest Risk Assessment for
Japanese Dodder (*Cuscuta japonica*. Choisy)
February 2009

Common Name: Japanese dodder (*Cuscuta japonica*) aka. Giant Asian dodder, Tu Si Zi
Family: Cuscutaceae

Findings of This Review and Assessment: *Cuscuta japonica* has been determined to be a potential invasive plant within the category of an “A” listed noxious weed as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. Using a rating system adapted from United States Department of Agriculture, Animal Plant Health Inspection Services, Plant Protection, and Quarantine (USDA APHIS PPQ) Weed Risk Assessment Guidelines, *Cuscuta japonica* received a score of **36** out of a potential score of **47**. Using the ODA Noxious Weed Rating system, the species received a score of **19** supporting an “A” listing. Japanese dodder is currently not identified in Oregon but is determined to be a threat to both native and ornamental plants should it be introduced and escape.

Introduction: Many species of parasitic dodder, native and non-native, can be found in the Pacific Northwest. All are low growing, attacking herbaceous crops and other plants in both agricultural and wildland settings. Japanese dodder is a unique and potentially troublesome species commonly found attacking a broad array of host shrubs, small trees, orchards and vegetables weakening or killing them. Its range in North America is currently limited to the southwest, Northern California, and several southeast states but the potential exists for the plant to invade and survive in the warmer areas of the Pacific Northwest. Early detection of this species is imperative to protect our valuable horticultural resources.



Photo: Cal.Dept.Food & Agric

Physical Characteristics: Japanese dodder vines are leafless, 1-3 millimeters in diameter with vibrant yellow-green or gold coloration. Purplish spots are also present. The vines contain no chlorophyll. Japanese dodder has thick, spaghetti-like, robust stems in contrast to native dodder stems which are usually more thread or string-like. Infestations are often large, spreading, and web-like, covering large shrubs and small trees. In contrast, infestations of other dodder species are likely to be smaller, infecting non-woody plants or small shrubs. For example, the invasive alfalfa dodder, common in alfalfa fields in Oregon, is bright yellow but far less robust. Flowers, if present are small, pale yellow to cream colored and are found growing on short dense spikes.

In cooler climates plants die back in the winter but in warm regions, the species grows almost continually year-round. In California, most Japanese dodder infestations have been found in residential areas and ornamental plantings. A few escaped riparian infestations have also been discovered. Most finds have been located in neighborhoods populated by people of SE Asian decent. This connection is a result of intentional plantings grown as a source of medicinal herbs. Japanese dodder is unlikely to be found in hot, dry desert climates or at high altitudes but it thrives in temperate climates throughout Asia indicating that its potential habitat in North America is large (Markmann and Marushia 1999).

Economic Impact: Japanese dodder is a serious economic threat to the agricultural and horticultural industries of many states. It is a Federally listed “A” rated species nation-wide and is restricted from all commerce and transport. Should the species become established in the Pacific Northwest and become widespread, the economic impact would be significant to the horticultural industry, to gardeners, orchard owners, park managers and to businesses associated with the production and care of ornamental plants. Potential impacts include: increased inspection of ornamentals grown for export, loss of markets due to the imposition of quarantines, infested private landscapes would have to be removed and replanted, maintenance costs in parks and public landscapes would also increase. Agriculturally, commercial fruit and nut trees would become infested and need to be removed. The species also serves as a host for several citrus viruses and “yellowing viruses” known to be detrimental to agricultural crops.

Medicinal Uses for Dodder: Japanese dodder and other dodders seeds are an ancient Chinese herbal remedy for impotence and improving male libido. It is also believed to provide internal balance by nourishing the kidney yin and yang (Chineseherbsdirect.com). It is the leading ingredient for many leading herbal male enhancement products on the market today.

Ecological Impact: In several southern states, Japanese dodder is well established in wild lands, nature reserves, roadsides, and on unimproved property. The species sickens and often kills its plant hosts. The loss of these plants in riparian areas would impact food chains, nesting habitat, streamside shading, erosion control, and a host of related benefits. Taller trees are resistant to the serious effects of infection but the impact on understory species could be widespread.



Photo: Cal.Dept.Food & Agric

Reproduction and Spread: Seed production in California and Texas has not been observed (Markmann and Marushia) and therefore not a contributor to localized spread in these states. Other southeastern US populations, on the other hand, can produce some viable seed, increasing the rate of spread that occurs in that region. Seeds disperse by moving water, soil disturbance or on transported machinery. Bird and animal movement may not be a factor. Asexual reproduction also occurs commonly through stem fragmentation and is a highly effective dispersal mechanism, seriously complicating control efforts. Intentional introduction through seed importation and planting also contributes to new introductions in California. Public education and a strong early detection programs have been initiated to limit this activity. Some infestations are the result of dodder seed contamination in agricultural products imported from foreign sources. This source remains a constant threat to high value agricultural commodity production. USDA-APHIS inspection services have intercepted several contaminated products during routine inspections (Markmann and Marushia), though others undoubtedly escape detection.

Native Range: Japanese dodder is common throughout eastern Asia. It ranges from China, Taiwan, Hong Kong, Manchuria, Japan, Korea, and Russia (Amur and Eastern Siberia). It is hardy in temperate to warm temperate climates (Markmann and Marushia).

North American Infestations: Significant infestations are found in Florida, South Carolina, and Texas (Markmann and Marushia). In California, Japanese dodder has been located in Shasta, Yuba, Contra Costa, Sacramento, Los Angeles, and seven other counties. The Shasta county infestation, located in Redding, is the most northern infestation identified. It was not controlled but died naturally during the winter. (CDFA weed alert).

Control Options: Japanese dodder has been introduced and eradicated in the U.S. several times. Once established though, it is very difficult to control. Plant material can be pulled from the host plant but the rooting structures, haustoria, remain in the bark and regenerate new vines. This necessitates complete or partial removal of the host plant. Effective control is a multi-year operation. Seeds can survive in the soil for 10-20 years requiring yearly monitoring. Current recommendations for control include pre-emergent herbicides for seedling control, hand hoeing, post-emergent herbicides, and pruning. All susceptible plants should be removed at least 10 feet from the edge of the infestation and kept free of host plants for years (Markmann and Marushia)

Assessing Pest Risk

The ODA-USDA modified risk assessment identifies several dominant factors that influence plant establishment, reproduction, dispersal, and impacts, and then applies numerical value to these factors. The choices taken by reviewers on each topic can often be very subjective and variable based on the knowledge, observations, and experience of the reviewer. Every effort was made by the authors to be inclusive in the descriptions as reasonably possible with the expectation that some weeds will not fit well in every category. It is intended that the risk assessment serve as a logical process for governmental agencies and weed control professionals for listing plant species as weeds and to help prioritize target species for control. Numerical values are often different for the various factors. This is done to add “weight” or increased value to certain factors over others.

Noxious Weed Qualitative Risk Assessment

Japanese dodder
Common name

Cuscuta japonica
Scientific Name

POINT CATEGORIES:

Intermediate scores apply: (e.g. = 4)

1) Habitat Availability: Habitat availability restrictive/non-restrictive on a plant's ability to survive and establish in the analysis area. *Abiotic* factors favor or restrict the ability of the plant to thrive in the available habitats. Choose the number that best applies and enter that number.

1. (Low) Susceptible habitat is very limited usually restricted to a small watershed or part of a watershed. Plant is severely confined by certain soil types, soil moisture holding capacity; freeze events, drought, and precipitation.

2. (Medium) Susceptible habitat encompasses 1/4 or less of the analysis area. Plant only moderately confined by environmental factors such as certain soil types, soil moisture holding capacity.

5. (High) Susceptible habitats is enormous covering large regions or multiple counties in the analysis area or limited to a restricted habitat of high economic/ecological value. Plant may demonstrate great adaptability to a variety of environmental conditions.

Score: 5

Explanation: Plant has a significant host range and is well adapted to a temperate environment common in the western half of the Pacific Northwest.

2) Probability of Further Expansion in the State: *Biotic* factors may restrict establishment or expansion of weed in state. If plant is parasitic, do suitable host plants exist for establishment? Choose the number that best applies and enter that number.

1. Biotic factors *damage* plant growth and/or prevent reproduction. Obligate pollinator not present. Plant not self-fertile. Competing vegetation, and human intervention may restrict establishment. Biocontrol agents already present on related species.

2. Biotic factors *restrict* or moderately impact growth and reproductive potential or plant is poorly or clearly not self-fertile and opposite sex not present or only male plants present.

3. Environment possesses ideal conditions for growth and reproduction. Plant expresses full growth and reproductive potential in environment. If dioecious then either sexes present or plant is self-fertile.

Score: 3

Explanation: Western Oregon *may* possess ideal growing conditions for growth. Host plants varied and abundant.

3) Dispersal Potential After Establishment: Choose the number that best applies and enter.

0. (Negligible) Weed has no *potential* for natural spread in the analysis area
1. (Low) Weed has potential for local spread within a year. Moderate reproductive potential or some mobility of propagules. Propagules may be moved locally by animals, wave action in lakes.
3. (Medium) Weed has moderate *potential* for natural spread with either high reproductive potential or highly mobile propagules. Propagules spread by moving water, humans or animals. Movement possible through long distance commerce.
5. (High) Weed has *potential* for rapid natural spread throughout its potential range. Weed has high reproductive potential and highly mobile propagules. Seeds are wind dispersed.

Score: 3

Explanation: Plant is distributed (minimally) through international commerce and grown by some ethnic groups. Asexual reproduction and dispersal is prevalent in infested areas.

4) Economic Impact: Plant has *potential* to cause or *demonstrates* negative impacts throughout analysis area resulting in reduced crop yield, lowered commodity value, increased cost of production or a loss of markets due to contamination or weed also may cause financial impacts to recreation, livestock health, fishing and hunting and property values. Control costs to manage infestations also considered. Choose the number that best applies and enter that number.

0. (Negligible) Weed causes none of the above impacts.
1. (Low) Plant has *potential* to cause or *demonstrates* moderate to low impacts throughout analysis area in one or few of the above categories.
3. (Medium) Plant has *potential* to cause or *demonstrates* moderate impacts in few of the above economic categories or moderate to low impacts over a wide range (over 5 types) of economic plants, recreation, products or livestock throughout analysis area.
5. (High) Plant has *potential* to cause or *demonstrates* significant impacts in many of the above categories throughout analysis area. Plant directly linked to human health concerns (e.g. poisoning, burns or contribute to increases in vertebrate or invertebrate pests which serve as infectious disease carriers). Control costs would be significant.

Score: 5

Explanation: Species attacks a large array of agronomic and horticultural plants impacting both agriculture and landscapes. Control costs are high.

5) Environmental Impact: Descriptions of environmental harm: Causes impacts on ecosystem processes; causes changes in plant community composition and function; causes indirect impacts that are measured by a reduction in aesthetic value, reduced opportunities for recreation and reductions in other non-monetary values. Choose the number that best applies and enter.

- 0. (Negligible) None of the above impacts probable.
- 1. (Low) Plant has *potential* to cause, or *demonstrates* few or minor environmental impacts throughout analysis area or impacts occur in degraded or highly disturbed habitats.
- 3. (Medium) Plant has *potential* to cause, or *demonstrates* moderate impacts throughout analysis area or impacts occur in less critical habitats.
- 5. (High) Plant has *potential* to cause, or *demonstrates* significant impacts in several of the above categories. Or plant causes impacts in select priority habitats such as aquatic, riparian, salt marsh, T&E plant sites, and other sites deemed critical.

Score: 3

Explanation: Plant attacks many species of native trees and shrubs, weakening or killing them. Community structure and composition may be affected.

6) Weed is a Pest in Similar Climactic Zones: Choose the number that best applies and enter.

- 1. Plant is strictly limited to one minor climactic area or zone. Plants *exhibit* little adaptability to new environments or complete information is lacking on plant distribution in climate zones.
- 2. Plant *demonstrates* weedy characteristics in non-origin areas only. Plant limited to a few climactic zones.
- 4. Plant is known to be a significant pest in similar climactic zones at place of origin or *demonstrates* significant adaptation to multiple climactic zones wherever it is found.

Score: 3

Explanation: Species inhabits a large array of climate zones from Eastern Siberia to southern China. It is a documented weed in many SE Asian countries.

7) Proximity to State: (Not currently documented in Oregon) Choose the number that best applies and enter.

- 1. Weedy populations mostly found in more distant US regions or foreign country only.
- 3. Weedy populations found in Western US regions but not *directly* adjacent to Oregon border.
- 6. Weedy populations *directly* adjacent to Oregon border.

Score: 4

Explanation: Nearest established and surviving population documented in mid to southern California. A population in Northern California at Redding has been eradicated.

8) Probability of Detection at Introduction Point: Choose the number that best applies and enter.

1. Plants growing where *probability* of rapid detection high, plants showy, public easily recognizes plant, access not limited.
2. Plant easy to identify by weed professionals, ranchers, botanists, and some survey and detection infrastructure in place.
3. Plant populations growing with high *probability* of no initial detection, plant shape and form obscure/not showy for much of growing season, introduction probable on lands remote or with limited access to weed professionals.

Score: 1

Explanation: Individual plants are very showy and often located in residential areas.

9) Probability of Weed Imported or Moved to Suitable Habitat by *Human Factors*: Choose the number that best applies and enter.

1. Low *probability* of introduction or movement. Plant not traded or sold or plant not found in agricultural commodities, gravel, or other commercial products.
3. Moderate *probability* of introduction or off-site movement. Plant not widely propagated, not highly popular with limited market potential or may be a localized contaminant of gravel or landscape products.
5. High *probability* that weed will be introduced or moved within state annually. Plant widely propagated, highly popular and widely sold or traded or plant propagules are a common contaminant of agricultural commodities. Or, high potential exists for movement by contaminated vehicles and equipment or by recreational activities.

Score: 3

Explanation: Introductions are occurring in multiple locations in the US but the rate of introductions is not high.

10) Current Distribution *Within Oregon*: Choose the number that best applies and enter.

1. Widespread occurrence throughout the state.
3. Regionally abundant (eastern/western Oregon, coastal area, Willamette Valley, Central Oregon, etc.)
6. Not known to occur, rare or uncommon in state.

Score: 6

Explanation: Not known to occur in state.

TOTAL POINTS: **36**

The total risk score for *Cuscuta japonica* (out of a possible 47) with the USDA APHIS Risk Assessment is: **36**

36-47 "A" Weed 24-35 "B" Weed Below 24: Unlisted

Risk assessment modified from USDA-APHIS Risk Assessment for the introduction of new plant species. Vers. 1.4 2/13/08

**OREGON DEPARTMENT OF AGRICULTURE
NOXIOUS WEED RATING SYSTEM**

Japanese dodder
Common Name

Cuscuta japonica
Scientific Name

Points Category

1) 3 Detrimental Effects: Circle all that apply, enter number of circles

1. Health: Causes poisoning or injury to humans or animals
2. Competition: Strongly competitive or injurious to/crops, forage, or native flora
3. Host: Host of pathogens and/or pests of crops or forage
4. Contamination: Causes economic loss as a contaminate in seeds and/or feeds
5. Interference: Interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement

2) 2 Reproduction & Capacity for Spread: Circle the number that best describes, enter number

1. Few seeds, not wind blown, spreads slowly
2. Many seeds or no seeds. Seed viability low or reproduction asexual.
3. Many seeds, spreads quickly by vehicles or animals
4. Windblown seed, or spreading rhizomes, or water borne
5. Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials

3) 4 Difficulty to Control: Circle the number that best describes, enter number

1. Easily controlled with tillage or by competitive plants
2. Requires moderate control, tillage, competition or herbicides
3. Herbicides generally required, or intensive management practices
4. Intensive management generally gives marginal control
5. No management works well, spreading out of control

- 4) **6 Distribution:** Circle the number that best describes, enter number
1. Widely distributed throughout the state in susceptible habitat
 2. Regionally abundant in state, 5 or more counties, more than 1/2 of a county.
 3. Abundant throughout 1- 4 counties, or 1/4 of a county, or several watersheds
 4. Contained in only 1 watershed, or less than 5 square miles gross infestation
 5. Isolated infestation less than 640 acres, more than 10 acres
 6. Occurs in less than 10 acres, or not present, but imminent from adjacent state

- 5) **4 Ecological Impact:** Circle the number that best describes, enter number
1. Occurs in most disturbed habitats with little competition
 2. Occurs in disturbed habitats with competition
 3. Invades undisturbed habitats and crowds out native species
 4. Invades restricted habitats (i.e., riparian) and crowds out native species

TOTAL POINTS: **19**

Note: Noxious weeds are those non-native plants with total scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as “A” rated weeds.

Ratings: **A** = 16+, **B** = 11–15

References:

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Cuscuta japonica- Japanese dodder. Plants for a Future 1996-2008

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North American Plant Protection Organizations, Phytosanitary Alert System. Pest Report October 26, 2001. Japanese dodder found in Houston, Texas

Pest Exclusion Advisory No 30-2005: California Department of Food and Agriculture, Plant Health and Pest Prevention Services. December 1, 2005

Summary of Dodder (Cuscuta japonica) Biology, Concerns, and Management (Prepared by C. Markmann, revised and augmented by R. Marushia 06/21/06)

http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/pdfs/jap_dodder_summary.pdf

Images:

http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/pdfs/jdodder_images.pdf